IMPERIAL MYCOLOGICAL
2 MAR. 1935

The Mysore Coffee Experiment Station—Circular No. 1.

DEPARTMENT OF AGRICULTURE

MYSORE STATE

REPORT ON THE DISEASE SITUATION IN COFFEE AREAS IN 1933

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INSTITUTE

BANGALORE:
PRINTED BY THE SUPERINTENDENT AT THE GOVERNMENT PRESS
1934

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REPORT ON THE COFFEE SITUATION

IN

COORG DURING 1921

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1921

REPORT ON THE DISEASE SITUATION IN COFFEE AREAS IN 1933.

Reports from all Coffee Districts during the monsoon of 1933 indicated a marked severity of Die Back and a considerably less successful control of this disease by spraying. In fact, an impression has gained currency that spraying has failed to give adequate protection and the organization of spraying has received a set back in consequence. In view of this, visits were paid to 19 estates by Mr. M. J. Narasimhan, the Mycologist to the Mysore Department of Agriculture and Mr. K. H. Srinivasan, the Assistant Director of Agriculture, Chikmagalur Circle. Mr. W. W. Mayne, U. P. A. S. I. Coffee Scientific Officer accompanied them to five estates in the early part of the tour.

The following note comprises the conclusions arrived at as a result of these visits, together with the results from certain observational records made at the experiment Station in connection with spray studies.

The extent of the damage was widespread; in the case of the worst estates it involved up to two-thirds of the cultivated area and in others, large patches in various parts of the estate. On the whole, however, the damage has not been as severe as was reported. The worst estate seen was considered by the manager to be less seriously attacked than in a previous year, before spraying was attempted and to be carrying very well under the circumstances the heaviest crop it had produced for a number of years.

The disease appears to have become evident in August and September and was characterized by a considerable fall of leaf not affected by Leaf Disease in both areas sprayed before the monsoon and in unsprayed areas. This fall of leaf was accompanied by the death of large numbers of shoots. An examination of twigs showed brown lesions on the internodes extending along the shoot, causing them to die backwards and forwards, and leaves in

advance of the attacked area fell. The decay of the shoot gradually extended to involve the young internodes, leaving finally a blackened dead and leafless shoot. Diseased material examined in the field always showed the presence of *Colletotrichum*, a fungus similar to that found associated with a similar Die Back in Uganda.

In previous work carried out in 1929 and 1930 by Mr. Mayne, *Colletotrichum* was found associated with Die Back of shoots which were previously defoliated by Leaf Disease. During that season, shoots showing Die Back showed the symptoms only after defoliation by Leaf Disease and no cases of Die Back of shoots with a more or less complete complement of leaves were found. It was concluded then that Die Back was a secondary disease following severe Leaf Disease or, in some cases, other debilitating factors.

In 1933, two factors appear to render this theory untenable as a complete explanation. In the first place the facts that infection by *Colletotrichum* and blackening of the shoot tissue occurred in shoots bearing a number of pairs of leaves is evidence of a lower importance of defoliation as a predisposing cause. Secondly in a number of areas, no evidence could be obtained that Leaf Disease was more severe in the period preceding the Die Back period than in other years. At the Station, it was noted however, that Leaf Disease was severe in June though Leaf fall was not noticeable at that time. Detailed counts in one area did reveal a leaf fall more than usual in June and July. Later information from parts of Coorg where Leaf Disease is usually less than in Mysore indicated a greater severity of the disease in the monsoon though there was not a large amount of Die Back.

Evidence from other countries of the pathogenicity of *Colletotrichum* on coffee is rather conflicting but there is no doubt that there are strains of the fungus which are primary parasites. In India, a leaf spot caused by a strain of this fungus has been known for many years, though it has never been serious economically. On the other hand, *Colletotrichum* spp. are commonly found on any coffee shoot which is dying, such as shoots on trees suffering from stump rot or Borer.

The possibility exists that in 1933, a parasitic strain of the fungus found highly favourable climatic conditions for its development, and the result was the destruction of large quantities of young shoots. This possibility will be

studied in the future and work has already commenced on a thorough re-examination of the relation of *Colletotrichum* to coffee.

The development of this situation in 1933 is undoubtedly to be attributed to the length of the showery period before the South West Monsoon and the early onset of the monsoon which was continuously wet during its early months. The fact that as far as the early showers are concerned, similar climatic conditions occurred in 1923 and 1928 accompanied by severe Die Back is clear evidence of this. In some areas the situation was undoubtedly aggravated by Leaf Disease which was also favoured by these conditions.

It remains to consider the results of spraying in order to discover whether there is any justification for the theory that spraying in 1933 failed to control Die Back. In previous years, spraying while controlling Leaf Disease, has also controlled Die Back, and reduced it to negligible proportions. This was shown by figures published in the bulletin on the spraying of coffee in South India. In 1933, the results have not been so successful but evidence from the Experiment Station shows clearly that some control was exerted, which in some areas was very satisfactory. The figures in the following table are striking in this respect.

Time and Strength of Spray Expt.	Die Back Sept. 1932. Per cent.	Die Back Sept 1933. Per cent.
0·5 per cent Pre—and Post—monsoon spray.	3·1	8·7
Control, unsprayed ...	8·8	23·5
Type of Spray Expt.		
Casein Bordeaux (Pre and Post spray).	...	33·7
Control, unsprayed ...	...	46·4

It can be seen that in the case of the first experimental area, the degree of control was about the same in each year, *i.e.*, the amount of Die Back on the sprayed block was about a third of that on the unsprayed block. There is no doubt that the spray had a beneficial effect although the severity of the disease was roughly three times as great as in the previous year. In the case of the second experiment, no previous data are available for comparison but it is clear that this area suffered more severely than the other and while some control of the disease resulted

from spraying, it was not as good as in the experiment first described.

The most striking feature is the high degree of variation in severity in areas separated by only a short distance and sprayed at almost the same time. Both the above experimental areas were sprayed within a week of one another in May. The variation in results, a variation which is equally marked in the data for leaf retention, suggests that the time at which the spray was applied was not the final determining factor for success in the pre-monsoon months of 1933. Everywhere, the evidence as to the most favourable time of spraying in 1933 is extremely conflicting. In some places an early spray in March gave the best results while in others, the May spray was more successful.

A study of the data for leaf retention in the type of spray experiment where results of spraying were poor compared with previous years, show, that in spite of these poor results, the control exerted was, relative to the control plots equal to that in other years. This is shown by comparing 1931 and 1933 for Casein Bordeaux with the results from the controls.

	1931	1933
Casein Bordeaux	6·28 leaves per shoot.	3·50 leaves per shoot.
Control, unsprayed	3·13 „ „	„ 1·72 „ „ „
Gain over Control	100 per cent.	103 per cent.

Thus, although the leaf retention in the sprayed plot was only a half that obtained in 1931, the amount of leaf in the control was also only a half of that present in 1931. The gain due to spraying was in each case 100 per cent over the control. If it is assumed that disease became established in March and April in this area, both areas of coffee would get attacked more or less equally severely as the greater proportion of the new growth on the sprayed area would be unprotected at that time. Spraying can do nothing in curing already established disease so that the disease situation would be much worse than usual in the sprayed area when the spray was applied. After the application any further spread of the disease should be checked and that this did in fact occur is shown by the difference between the control plots and the sprayed plots when observations were made in September. The conclusion suggested by the data is that the poor result from spraying in this area was not due to the failure of

protective power of the spray but to a greater intensity of disease in the period preceding the application of the spray against which the application was powerless.

With such a long period of showery weather between the blossom showers and the monsoon, it seems that disease conditions had time in this area, and, of course in many others, to reach a severity sufficient to reduce considerably the effectiveness of the late spray. With an early spray, on the other hand, the long growing period gave plenty of opportunity for new growth developed after the spray, to become infected by Leaf Disease and Die Back. On the whole, since the major portion of the growth occupied the early portion of the period, an early spray in some cases had an opportunity to give a greater degree of protection than a later one. This was not universally the case however for in areas where growth was considerable, and extended over a long period, diseases were as severe or more severe than in late sprayed areas. Such areas would have large areas of unprotected leaf and shoot open to infection by Leaf Disease and Die Back. The actual position in any one area would depend on the previous history of that area. As an illustration it may be mentioned that areas which bore a heavy crop and lost a great deal of leaf in the early months of the year, appeared to suffer less than other areas which carried larger amounts of leaf through from the previous year.

The development of Die Back was extremely uneven, a feature which was noted in the closely similar, if not identical Nilgiri twig disease in 1904, which suggests that conditions leading up to it are localized in development. Areas therefore, may react differently to sprays applied at the same time according to the proportion of growth occurring after the spray is applied, the status of the disease or diseases in the area at the commencement of showery weather, and the opportunity of infection during the showery weather. When, as in 1933, the showery period is long, and consequently also the growing period, diseases have a longer period available for development, especially diseases which are favoured by intermittent showery weather, and differences between areas are liable to be more extreme than in years when the period is relatively short.

It must be admitted that years of a lengthy showery period in the months preceding the monsoon present a very difficult problem for spraying organization. On the

evidence of the present year, it is hardly possible to come to a definite conclusion. It is clear, however, that a great deal depends on the vegetative and reproductive state of the coffee in a particular area. Several areas this year which bore heavy crops in 1932-33 and were lightly pruned in the early hot weather, reacted favourably to a late spray and showed little Die Back. Other areas, unpruned, and bearing more moderate crops in the preceding season suffered more than usual with a late spray.

An examination of the length of the showery period in 1933 indicated that the time between the first showers and the onset of the monsoon was 50 per cent longer than normal. As an experimental measure for trial in the event of a recurrence of this type of weather distribution, it is suggested that this extra time be utilized for a second spray before the monsoon breaks on areas done first or on areas known to be particularly liable to disease in the early monsoon period.

It is realised that difficulties exist in addition to the question of cost. The one of time, however, has already been discussed and is met by the fact that extra time is available owing to the length of the showery period. As for cost, it seems likely that under special circumstances, it might be more profitable to do a second spray in the pre-monsoon period and to omit the post-monsoon spray. Thus the second pre-monsoon application need not increase the cost if the post-monsoon spray is omitted. These are matters for experiment when suitable climatic conditions arise. They are suggested to meet the difficulty created by a long period favourable to disease development between the blossom showers and the monsoon.

One or two suggestions made during the year with regard to the causation of the excessive Die Back noticed were considered on the basis of observations made by the three officers.

1. "Wet Feet." Undoubtedly a high water table extending over any considerable period will result in damage to coffee which will reveal itself in shed leaves and decaying shoots. It may be that in some areas this year this has been a contributory cause. As a general explanation it cannot be entertained, because many of the severely attacked areas were precisely those where drainage conditions are satisfactory and, conversely, some areas where drainage was obviously bad, did not suffer more than other areas. There was no close correspondence

between soil and topographical features and the incidence of Die Back, which would have been expected if lack of adequate drainage under the very wet conditions of 1933 was the main causative factor. In a number of cases, Die Back was especially severe on ridges and slopes where there was little chance of a high standing water table. Also one area at the Station where plants were standing at a tank side showed no more severe Die Back in August than areas higher up the slope. It may also be noted that 1928 when Die Back was severe following a long showery period between the blossom showers and the monsoon was a year of low monsoon rainfall.

2. Types of Shade. It has been suggested that the disease was associated with certain shade trees, more particularly Grevillea. Observations on a number of estates do not suggest that the Die Back can be associated with any particular shade tree. In the case of severe attacks under Grevillea, it may be that the light shade given by pure stands of this tree in many areas aggravated Leaf Disease which was a contributory cause of the Die Back in some places. It is of course possible that severe root competition from some shade trees might have a debilitating effect on surrounding plants, giving symptoms simulating those of a parasitic Die Back. There did not appear to be any close association between Die Back and particular shade which could afford a general explanation of the situation in 1933.

Summary.

1. Die Back developed seriously in August and September 1933 in both sprayed and unsprayed areas.

2. The theory that defoliation by Leaf Disease is a necessary precursor of Die Back was found an incomplete explanation of its origin in 1933, and evidence suggested that the *Colletotrichum* always associated with Die Back affected shoots, or at least a strain of it was capable of attacking leafy shoots without preliminary attack by Leaf Disease.

3. Conditions favoured early Leaf Disease which was probably a contributory factor and aggravated the position.

4. The cause of the severe attacks in 1933 are attributable to the early onset of blossom showers and continued showery weather up to the early beginning of

the South West monsoon. Similar climatic conditions were associated with similar outbreaks in 1923 and 1928.

5. Spraying was found to be very variable in its effects in 1933, and though it always seemed to afford some control of the diseases, the degree of control was very variable. It seems that this variability was due in some cases to a considerable development of disease before the application of the spray, and in others to considerable production of unprotected growth after the spray. In any case, the results of spraying, were not clearly related in this year to the time of spraying, some areas sprayed early and some sprayed late being protected and some similarly treated were less adequately protected.

6. As a possible experimental measure in years like 1923, 1928 and 1933 the application of two sprays before the monsoon to parts of the estates especially liable to disease is suggested, the extra time between the blossom showers and the South West monsoon being utilized for this purpose.

7. Explanations based on waterlogging and shade do not afford satisfactory general explanations of the Die Back situation in 1933.

WD 1076—GPB—1000—13-2-34